UARS

Upper Atmosphere Research Satellite

Mission Objective
The objective of this mission is to study the physical processes acting within and upon the stratosphere, mesosphere and lower thermosphere. In particular, the mission is designed to: 1) Understand the coupled energy input, chemistry and dynamics that control upper atmosphere structure and variability, 2) Understand the response of the upper atmosphere to natural and anthropogenic perturbations, and 3) Define the role of the upper atmosphere in climate and climate variability.

TYPE OF MISSION	PROGRAM OFFICE	PROJECT LEAD CENTER	MANAGEMENT APPROACH	S/C CONTRACTOR	I&T CONTRACTOR
EARTH SCIENCES & APPLICATIONS	SPACE SCIENCES & APPLICATIONS	GSFC	OUT-OF-HOUSE	GE	GE

Payload Description
The UARS payload consists of 10 scientific instruments (primarily remote sensors) built around a Multimission Modular Spacecraft (MMS). Also included is an MMS hydrazine Propulsion Module (PM-1A), which is used for orbit adjust maneuvers and for unloading the attitude control reaction wheels. The Solar Stellar Pointing Platform (SSPP) is a two-axis, gimbaled system that points three instruments at the sun during portions of each orbit for solar observations, and at selected bright stars for SOLSTICE calibration. The UARS ground system includes a Project-dedicated Central Data Handling Facility (CDHF) with remote terminal linkups and institutional facilities.

INSTRUMENT NAME	ACRONYM	PI AFFILIATION	PRINCIPAL INVESTIGATOR	I&T CONTRACTOR
ACTIVE CAVITY IRRADIANCE MONITOR II	ACRIM II	JPL	R. C. WILLSON	JPL
CRYOGENIC LIMB ARRAY ETALON SPECTROMETER	CLAES	LPARL	A. ROCHE	LMSC
HALOGEN OCCULTATION EXPERIMENT	HALOE	LARC	J. M. RUSSELL	LARC
HIGH RESOLUTION DOPPLER IMAGER	HRDI	UNIV MICHIGAN	P. B. HAYS	UNIV MICHIGAN
IMPROVED STRATOSPHERIC 8 MESOSPHERIC SOUNDER	ISAMS	OXFORD UNIV	F. W. TAYLOR	UNIV OXFORD/ RUTHERFORD LAB
MICROWAVE LIMB SOUNDER	MLS	JPL	J. W.WATERS	JPL
PARTICLE ENVIRONMENT MONITOR	PEM	SWRI	J. D. WINNINGHAM	SWRI
SOLAR STELLAR IRRADIANCE COMPARISON EXPERIMENT	SOLSTICE	UNIV COLORADO	C. ROTTMAN	UNIV COLORADO
SOLAR UV SPECTRAL IRRADIANCE MONITOR	SUSIM	NRL	G. BRUECKNER	NRL
WIND IMAGING INTERFEROMETER	WINDII	YORK UNIV	G. G. SHEPHERD	AIT/CAL

Instrument Descriptions
The UARS Active Cavity Radiometer Irradiance Monitor II **(ACRIM** II), Data Point 665, is designed by the Jet Propulsion Laboratory and is similar in design to the SMM ACRIM9. The ACRIM ll is designed to continuously measure the solar total irradiance with uniform sensitivity from the far-ultraviolet to the far-infrared wavelength range with high precision and accuracy.
The UARS Cryogenic Limb Array Etalon Spectrometer (CLASS), Data Point 667, is designed and built by Lockheed to obtain global measurements of the concentration of a series of stratospheric minor species which are of significant interest to the photochemistry of the stratosphere, in general, and the ozone layer in particular. Characteristic infrared vibration rotation line spectra of the species of interest are measured simultaneously at 20 different limb altitudes from 10 to 60 km. The measured spectral radiances are then inverted through an iterative relaxation process to yield concentration and temperature at each of the altitude points or pressure heights.
The UARS Halogen Occultation Experiment (HALOS), Data Point 696, is a gas filter correlation radiometer used for measurement of selected gases and broad band spectroscopy. It consists of an optics unit supported on a two-axis gimbal and an off-gimbal electronics unit. The optics unit contains the optics, modulators, detectors, and preamps for all gas detection channels. A 16-centimeter diameter reflective telescope collects solar energy for all channels. The incoming solar energy is chopped at 150 Hz using a reflective chopper. Reflected energy is directed to the instrument's radiometer channels. Non-reflected energy is directed to the gas filter channels.
The UARS High Resolution Doppler Imager (HRDI), Data Point 645, is built by the University of Michigan. Similar to the DE-2 Fabry-Perot Interferometer, the instrument uses a triple etalon Fabry-Perot Interferometer to analyze the ozone absorption features of scattered light at lower altitudes and emission features at higher altitudes. Inputs are received from a gimballed telescope through a light pipe to an image plane detector with a spectral range of 3000 to 8000 angstroms.
The UARS Improved Stratospheric & Mesospheric Sounder (ISAMS) scientific objectives are to determine the thermal structure of the atmosphere and its fluctuations in space and time (e.g., with season), to investigate the photochemistry of nitrogen-containing species in the stratosphere and to study the water vapor budget of the upper atmosphere. ISAMS uses infrared pressure-modulator radiometry to measure termal emission from selected atmospheric constituents at the Earth's limb. The radiance profiles obtained in this way are used to obtain nearly global coverable of the vertical distributions of temperature and composition from 80 degrees South to 80 degrees North latitude.
The UARS Microwave Limb Sounder (MLS), Data Point 666, is designed and developed by JPL to measure atmosphere thermal emission from selected molecular spectral lines at millimeter wavelengths. Profiles of geophysical parameters are inferred from the intensity and spectral characteristics of this emission and from its variation as the MLS line of sight is scanned vertically through the atmospheric limb. The instrument includes a sensor, spectrometer, and power supply. The sensor includes a three-mirror antenna system that defines the field of view and a radiometer box. The radiometer box houses the radiometers, the multiplexing optics, and the calibration system.
The UARS Particle Environment Monitor (PEM) measures how X-rays and charged particles (electrons and protons) from the Sun interact with Earth's magnetic field and the upper atmosphere. The PEM consists of four instruments: 1) Atmospheric X-ray Imaging Spectrometer (AXIS); 2) High Energy Particle Spectrometer (HEPS); 3) Medium Energy Particle Spectrometer (MEPS) and 4) Vector Magnetometer Sensor (VMS). The instruments are placed at strategic locations on the spacecraft to provide the best viewing angles.
The UARS Solar UV Spectral Irradiance Monitor (SUSIM), Data Point 648, is designed and built by NRL to measure Solar Flux in the 1200-4000 angstrom spectral region. This instrument is a direct descendant of the OSS-1 SUSIM, Data Point 607, with changes to provide for a longer lifetime and increased reliability. The instrument uses seven detectors, two photomultipliers and five photodiodes in a detector wheel along with four deuterium calibration lamps and two doubledispersion scanning spectrometers.
The UARS Solar Stellar Irradiance Comparison Experiment (SOLSTICE), Data Point 649, is developed by the University of Colorado to measure the full disk solar spectrum in the 1150-4000 angstrom spectral region. The instrument consists of a small grating spectrometer with three photomultiplier tubes mounted to a spacecraft scan platform to provide solar and stellar observations. Solar UV stability is compared to selectcd UV stars with an accuracy of 1 percent.
The OARS Wind Imaging Interferometer (WINDII) senses temperatures and winds in the upper atmosphere by measuring the Doppler widths and shifts of isolated specral lines emitted by the airglow and aurora in the mesosphere and the lower thermosphere. The instrument views the atmospheric limb simultaneously in two directions, 45 degrees and 135 degrees from the velocity vector. This provides both horizontal components of the neutral wind. The instrument consists essentially of a CCD camera viewing the Earth limb through a field-widened Michelson interferometer.

Launch
9/12/91